





# PERSONNEL QUALIFICATION STANDARD

FOR

**LPH-2 CLASS ENGINEERING**

**QUALIFICATION SECTION 8**

**ELECTRICAL**

**CHIEF OF NAVAL EDUCATION AND TRAINING**

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This is a brief explanation on how to use your Personnel Qualification Standard. A more detailed description on the use of the PQS system is contained in NAVEDTRA 43100-1A (HANDBOOK ON MANAGEMENT AND IMPLEMENTATION PROCEDURES FOR PERSONNEL QUALIFICATION STANDARDS).

Do not become concerned with the thickness of this book and the number of words on each page. Broad knowledge of a subject may be affirmed by brief answers to the questions.

Your Personnel Qualification Standard was developed by determining the skills you need at your watchstation. General theory and equipment systems were then identified to ensure you have the background knowledge to properly perform your duties.

This Standard has four main subdivisions: Theory (100 Section), Systems (200 Section), Watchstations (300 Section), and Qualification Card (400 Section). Note that the pocket-sized Qualification Card questions match those in the Watchstation section and provide a space for your supervisor's signature.

As you look through the Standard booklet you will notice that the Theory Section contains the facts, principles, and fundamentals concerning the subject you are qualifying for. The Systems Section deals with the major working segments or components of an installation, organization or equipment which requires specific attention. The last section in the booklet, the Watchstation Section, defines the actual duties, assignments and responsibilities which you will be performing to obtain your qualification.

The first thing to do on your road to qualification is to open your Qualification Card. You will see that at the beginning of each Watchstation, the supporting Theory and Systems Sections are listed. Turn to your PQS booklet and answer the Theory and Systems questions applicable to the Watchstation you are working on. Once the supporting Theory and Systems are completed, you are ready to start accomplishing the tasks leading to "QUALIFICATION" in your Watchstation.

When you have answered the Watchstation questions and demonstrated your proficiency performing the Watchstation tasks, your Supervisor (qualifying petty officer) will sign his name in your Qualification Card as you complete each task. Your qualification may range from informal observation of your watchstanding performance to a formal qualification board. Your Commanding Officer's signature on the front cover of the Qualification Card is the final authority qualifying you to perform your Watchstation duties.

If you have suggestions for improvement of this Qualification Standard, use the Feedback Form in the back. It is a direct input from you to the PQS Development Group and you will receive a prompt reply from the product manager who maintains the status of your Standard.

Good Luck!

0501-LP-221-4

## GLOSSARY OF TERMS USED IN PQS

BLOCK DIAGRAM - A drawing of a system using blocks for components to show the relationship of components. Inputs and outputs of the components may be indicated by labeled lines and/or arrowheads showing the flow path.

CASUALTY - An event or series of events in progress during which equipment damage and/or personnel injury has already occurred. The nature and speed of these events are such that proper and correct procedural steps will only serve to limit damage and/or personnel injury.

CLASSIFICATION AND/OR TYPE - To give the type of classification of various equipment, i.e., (a) check valve-swing, stop, etc; (b) valve-solenoid, manual, etc.

COMPONENT - The major units that make up a system when properly connected.

COMPONENT PART - The integral part of a component.

CONTROL SIGNAL - A signal used to activate control circuitry or indication, i.e., the signal from a pressure switch.

DEFINE - State meaning of

t or give an account of in words.

- Converse, demonstrate a Basic familiarity.

DRAW - To graphically define the functional location of all major components in a system with a block diagram.

EMERGENCY - An event or series of events in progress which will cause damage to equipment and/or personnel unless correct procedural steps are taken immediately.

ENSURE - To make certain.

EXPLAIN - Show the logical development of relationships, give a detailed account.

FAIL - 1. The loss of control signal or power to a component.  
2. The breakage or breakdown of a component part.

FAIL POSITION - The inoperative status of a device because of the loss of its actuating electrical, electronic, pneumatic, or hydraulic control signal.

FUNCTION - To perform the normal or characteristic action of anything, or special duty or performance required of a person or thing in the course of work.

FUNCTIONAL LOCATION - The logical/operational position of a component based on its contribution to the system. (As depicted in a block diagram.

IDENTIFY - To recognize, point out or prove to be as purported or asserted.

INTERLOCK - A feature/device in one system or component that affects the operation of another system or component. Generally a safety device but may be used to control the operating sequence of components.

LIST - Enumerate by category.

MONITOR - Assist normal Watchstanders in the conduct of their assigned duties.

MONITORING POINT - The physical location at which any indicating device displays the value of a parameter at some control station.

OPERATING CHARACTERISTICS - The combination of a parameter and its setpoints.

PARAMETERS - A variable such as temperature, pressure, flow rate, voltage, current, frequency, etc., which may be indicated, monitored, checked or sensed in any way during operation or testing.

PHYSICAL LOCATION - The actual location of a component within a system.

PROTECTIVE FEATURE - A feature of a component or component part designed to protect a component or system from damage.

PURPOSE - A statement in justification or explanation of.

REVIEW - To examine or study again.

SCHEMATIC DIAGRAM - A drawing of a system using only one line to show the tie-in of various components, i.e., the three conductors needed to transmit 3-phase power are represented by a single line.

SENSING POINT - The physical and/or functional point in a system at which a signal may be detected or monitored or may cause some automatic operation to result.

SETPPOINT - The numerical value of a parameter at which: (a) an alarm is actuated, (b) operator action is required, or (c) proper operation ceases and damage may occur.

SIMPLE SKETCH - A simplified drawing of a system.

STANDARD PRINT - A standard drawing, schematic, illustration, or blueprint produced in the applicable technical manual or other official technical publication.

STATE - To set forth or recount the particulars verbally.

SUPERVISE - Direct the activities of Watch teams/or individuals in the conduct of their assigned duties.

SYSTEM - The major functional segment of an installation/organization selected for individual attention.

SYSTEM INTERRELATION - Specific individual operations in one system affecting the operation of another system under normal conditions which are not fully described in emergency or casualty procedures or in the functional discussion of the system.

THEORY - A coherent group of facts, principles, or propositions used to explain or describe.

TRACE - To physically follow the layout of a system.

VERIFY - To ascertain the correctness of.

WATCHSTATION - Duties, assignments or responsibilities which an individual or group may be called upon to perform. Not necessarily a normally manned position with a "watchbill" assignment.

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This section identifies knowledge objectives supportive to the understanding of applied DC circuits. Reference used was:

a. Basic Electricity

- .1 Explain the relationship between voltage, current and resistance.
- .2 State Ohm's Law for determining voltage, current and resistance when only two are known.
- .3 State Kirchhoff's Law for parallel and series circuits.
- .4 State the equation for determining power in a DC circuit.
- .5 Draw a series-parallel circuit indicating voltage, current, resistance and power values, and solve for the following:
  - .51 Total resistance
  - .52 Total current
  - .53 Voltage drops across resistance
  - .54 Current for each branch circuit
  - .55 Power consumed by each resistor

This section identifies knowledge objectives supportive to the understanding of applied AC circuits. Reference used was:

a. Basic Electricity

- .1 Define the terms "inductance" and "capacitance."
- .2 State the equations for determining inductive and capacitive reactance in an AC circuit.
- .3 Define the term "impedance" (Z).
- .4 State the equation for determining the impedance of an AC circuit and solve one example for each of the following:
  - .41 Series RL and RC
  - .42 Parallel RLC
- .5 Explain the relationship between true power, apparent power and power factor in an AC circuit.

This section identifies knowledge objectives supportive to the understanding of magnetic principles and terminology. References used were:

- a. Basic Electricity
- b. Synchro, Servo and Gyro Fundamentals

- .1 State the three fundamental laws of magnetic flux lines.
- .2 Explain the method(s) of determining direction of flux around a current-carrying conductor.
- .3 Define the following terms:
  - .31 Permeability
  - .32 Retentivity
  - .33 Gauss
  - .34 Maxwell
  - .35 Hysteresis
  - .36 Saturation
- .4 Draw and explain an ideal hysteresis loop.

This section identifies knowledge objectives supportive to the understanding, operation, and application of basic magnetic control devices. Reference used was:

a. Basic Electricity

.1 Define the following terms:

- .11 Henry (L)
- .12 Flux density (B)
- .13 Magnetizing force (H)
- .14 Saturable reactor
- .15 Magnetic amplifier

.2 Explain the function(s) of the following windings used in magnetic amplifiers:

- .21 Control
- .22 Bias
- .23 Feedback

This section identifies knowledge objectives supportive to the understanding of the construction, protection and operation of manual starters. References used were:

- a. Electrician's Mate 3 & 2
  - b. Naval Ships' Technical Manual, Chapter 302 (old 9630)
- .1 State the difference(s) between a starter and a controller.
  - .2 Explain the operation of the following types of starters/ controllers:
    - .21 Across-the-line
    - .22 Resistor start (stepping)
  - .3 Define the following terms:
    - .31 Low-voltage protection
    - .32 Low-voltage release
    - .33 Overload protection
  - .4 Describe the operation of the following overload protection devices:
    - .41 Thermal
    - .42 Magnetic
    - .43 Induction
  - .5 Explain the function(s) of the following:
    - .51 Main contacts
    - .52 Auxiliary contacts
    - .53 Maintaining contacts
    - .54 Pilot circuit
  - .6 Draw and explain the operations of the following manual controller configurations:
    - .61 Across-the-line low-voltage release
    - .62 Across-the-line low-voltage protection

This section identifies knowledge objectives supportive to the understanding and operation of DC motors/generators. References used were:

- a. Basic Electricity
  - b. Electrician's Mate 3 & 2
  - c. Electrician's Mate 1 & C
  - d. Naval Ships' Technical Manual, Chapter 310 (old 9610) and Chapter 302 (old 9630)
- .1 Explain the right-hand rule as applied to DC motors.
  - .2 Define the following terms:
    - .21 Torque
    - .22 Horsepower
    - .23 Electromotive force (emf)
    - .24 Counterelectromotive force (counter emf)
    - .25 Armature reaction
    - .26 Commutation
  - .3 Explain the function of commutating poles.
  - .4 Draw a simple sketch of the following DC motors:
    - .41 Shunt
    - .42 Series
    - .43 Compound
    - .44 Stabilized shunt
  - .5 Describe the method(s) of reversing the rotation of a DC motor.
  - .6 State the function and need for a field-flashing capability for DC generators.



This section identifies knowledge objectives supportive to the understanding, construction and operation of common-type AC motors/generators. References used were:

- a. Basic Electricity
  - b. Electrician's Mate 3 & 2
  - c. Electrician's Mate 1 & C
  - d. Naval Ships' Technical Manual, Chapter 310 (old 9610) and Chapter 302 (old 9630)
- .1 Define the following terms:
    - .11 Synchronous speed
    - .12 Slip
    - .13 Squirrel cage
    - .14 Universal motor
    - .15 Slip rings
  - .2 Explain the principles of operation of a squirrel-cage induction motor.
  - .3 Draw a simple sketch of each of the following AC motors:
    - .31 Universal
    - .32 Split phase
    - .33 Three-phase induction
    - .34 Wound rotor
    - .35 Capacitor start-induction run
    - .36 Repulsion start-induction run
  - .4 Draw and explain the operation of a self-synchronous motor.
  - .5 State the equation for determining the frequency of an AC generator.

BATTERY THEORY I

This section identifies knowledge objectives supportive to the understanding of the construction, types and ratings of commonly used batteries. References used were:

- a. Basic Electricity
- b. Naval Ships' Technical Manual, Chapter 313 (old 9622)

.1 Define the following terms:

- .11 Cell
  - .12 Electrode
  - .13 Electrolyte
  - .14 Primary cell
  - .15 Secondary cell
  - .16 Polarization
  - .17 Local action
- .2 Name the different types of wet cell batteries.
- .3 Name the types of dry cell batteries that are commonly used in the Navy, stating the voltage rating for each.

This section identifies knowledge objectives supportive to the understanding of the ratings and general charging of lead-acid storage batteries. References used were:

- a. Basic Electricity
  - b. Electrician's Mate 3 & 2
  - c. Electrician's Mate 1 & C
- 
- .1 Define the term "ampere-hour."
  - .2 Describe the materials needed to measure the specific gravity of a lead-acid battery during charging.
  - .3 Explain the following types of charges:
    - .31 Initial
    - .32 Normal
    - .33 Equalizing
    - .34 Floating
    - .35 Fast (emergency)
  - .4 State the procedures and materials necessary for mixing sulfuric acid and distilled water.
  - .5 State the formula for correcting a specific gravity reading due to temperature.

This section identifies knowledge objectives supportive to the understanding, applications and characteristics of batteries. References used were:

- a. Basic Electricity
- b. Electrician's Mate 3 & 2

- .1 Discuss the following terms:
  - .11 Charging rate
  - .12 Charging time
  - .13 Gassing
- .2 Describe the two methods of determining the state of charge of a nickel-cadmium battery.
- .3 Discuss the method of connecting batteries for the following conditions:
  - .31 Increasing voltage
  - .32 Increasing amperage

This section identifies knowledge objectives supportive to the understanding of the terminology and equipment associated with a shipboard degaussing system. Reference used was:

a. Electrician's Mate 3 & 2

- .1 State the purpose of shipboard degaussing installations.
- .2 State the polarity of the earth's magnetic field.
- .3 Explain the effect(s) of a metal hull ship upon the earth's magnetic field.
- .4 Define the terms "horizontal component" (H) and "vertical component" (Z) in terms of the earth's magnetic field.
- .5 Name the publication used for determining the settings of degaussing coils.

This section identifies knowledge objectives supportive to the understanding of the functions and operation of a shipboard degaussing system. Reference used was:

a. Electrician's Mate 3 & 2

.1 Define the following terms:

- .11 Permanent component
- .12 Magnetic heading
- .13 Induced component
- .14 True heading
- .15 Magnetic signature

.2 Explain the effects on the ship's induced component caused by the ship's heading.

.3 State the function of the magnetic heading variation circuit.

.4 Describe the function(s) and physical location of the following degaussing coils:

.41 FI-QI

.42 FP-OP

the function and need for magnetic compass compensating

the purpose of the three-course emergency/emergency-manual operations.

the purpose of a degaussing range.

This section identifies knowledge objectives supportive to the understanding and operation of an automatic degaussing installation. References used were:

- a. Electrician's Mate 3 & 2
  - b. Electrician's Mate 1 & C
- .1 Define and explain the following components of the earth's magnetic field:
- .11 Equator
  - .12 Hemisphere
  - .13 Latitude
  - .14 Poles
- .2 Explain the following components of a ship's magnetic field:
- .21 Vertical permanent
  - .22 Horizontal permanent
  - .23 Vertical induced
  - .24 Horizontal induced
    - a. Longitudinal
    - b. Athwartships
- .3 Explain the principle of detection of a magnetic mine or torpedo detonator.
- .4 State the method and reason for deperming ships.
- .5 State the function of shipboard degaussing systems.
- .6 Explain the effect(s) upon the following ship's magnetic components caused by changes in heading, latitude, roll and pitch:
- .61 Vertical induced
    - a. Longitudinal
    - b. Athwartships
  - .62 Horizontal induced
- .7 State the ship's induced component that is maximum at each of the following magnetic headings:
- .71 000
  - .72 090
  - .73 180
  - .74 270
- .8 State the magnetic polarity of a ship's starboard side as located on the magnetic equator on the following headings:
- .81 000
  - .82 090
  - .83 180
  - .84 270
- .9 State the magnetic polarity of the ship's bottom (keel) at the North magnetic pole.

This section identifies knowledge objectives supportive to the understanding of blueprint usage. Reference used was:

a. Blueprint Reading and Sketching

- .1 Using your shipboard blueprint system:
  - .11 Explain where the master index is located and why.
  - .12 Explain the information contained in the master index.
  - .13 Locate the blueprint for any given circuit or drawing.
- .2 Describe the information contained in the following areas of a blueprint:
  - .21 Reference plans
  - .22 Revisions
  - .23 Title block
  - .24 List of materials
  - .25 General notes
- .3 Explain the procedures for the preservation and stowage of blueprints onboard.
- .4 Describe the difference between an isometric and an elementary schematic wiring diagram.



This section identifies knowledge objectives supportive to the understanding of ship organization. References used were:

- a. Engineering Department Organization Manual
  - b. Engineering Administration
  - c. Fireman
  - d. Naval Ships' Technical Manual, Chapter 001 (old 9000) and Chapter 090 (old 9004)
  - e. Standard Organization and Regulations of the U.S. Navy
- 
- .1 Explain the procedures required aboard your ship to gain permission to "go aloft."
  - .2 State the purpose of the electrical log.
  - .3 Draw an engineering department organization chart and define the duties of all personnel.
  - .4 Draw an in-port watch organization chart and define the duties and responsibilities of each watchstander.
  - .5 Describe tag-out procedures and log entries.

This section identifies knowledge objectives supportive to the understanding of departmental reports. References used were:

- a. Engineering Department Organization Manual
- b. Engineering Administration
- c. Naval Ships' Technical Manual, Chapter 001 (old 9000) and Chapter 090 (old 9004)

- .1 Describe the general duties of the electrical department supervisor.
- .2 State the duties of the following:
  - .21 Engineering Training Officer
  - .22 Damage Control Assistant
  - .23 Engineer Officer
- .3 Explain the following reports:
  - .31 Electrical log
  - .32 Monthly summary
  - .33 Engineering Officer Night Order Book
  - .34 Boiler record sheet
- .4 Describe the steps required to obtain permission to start/test major machinery in port.

This section identifies the terms, principles and laws of SAFETY PRECAUTIONS THEORY. References used were:

- a. Naval Ships' Technical Manual, Chapter 300 (old 9600), Section 2
  - b. Navy Safety Precautions for Forces Afloat
  - c. Electrician's Mate 3 & 2
  - d. Standard First Aid Training Course
  - e. Standard Organization and Regulations of the U.S. Navy (OPNAVINST 3120.32)
  - f. Accident Prevention Manual, Chapter 3
  - g. Accident Investigation and Reporting
- 
- .1 Explain how various levels of potential affect current flow through the body.
  - .2 Explain how variations in environmental conditions affect body resistance.
  - .3 Explain the action required when a space reports high heat and humidity conditions.
  - .4 Explain how electrical shock can be prevented when working on an energized circuit.
  - .5 Explain the use of insulating material to protect personnel.
  - .6 Explain the procedures to be observed when using test equipment.
  - .7 Explain the procedures to be followed prior to working on electrical machinery or equipment.
  - .8 Explain how a shorting bar is used to discharge live capacitors.
  - .9 Explain the use of interlocks installed in/on electrical equipment.
  - .10 Explain the procedures to be followed when measuring extremely high voltage.
  - .11 Explain the purpose and implementation of the tag-out system.
  - .12 Explain the purpose of danger tags.
  - .13 Explain the procedure for the replacement of fuses using fuse pullers.
  - .14 Describe the safety precautions applicable to portable electrical equipment.
  - .15 Describe the dangers of open electrical circuits due to environmental conditions.
  - .16 Explain the use of isolation transformers.
  - .17 Describe the procedures and safety precautions to be observed while going aloft, working aloft and descending.
  - .18 Explain the procedures to be followed when combating an electrical fire.
  - .19 Name the agents to be used for fighting electrical fires, explaining the application(s) of each.
  - .20 Name the desirable cleaning agents for electrical equipment, explaining the characteristics of each.
  - .21 Explain the procedures to be followed when handling acid and electrolyte while shipping, storing and handling.
  - .22 Describe the protective clothing to be worn when handling acid and electrolyte.

SAFETY PRECAUTIONS THEORY (CONT'D)

- .23 Explain the procedures for removing a victim from an energized circuit.
- .24 Explain the treatment for electrical shock.
- .25 Describe the preferred method of artificial resuscitation and cardiac massage.
- .26 Explain the procedure(s) to be used for neutralizing acid on skin and eyes.
- .27 Discuss the eight basic accident cause factors as defined in reference f.

8201.1 Explain the function(s) of the AUTOMATIC DEGAUSSING SYSTEM as stated in:

- a. Naval Ships' Technical Manual, Chapter 475 (old 9813)
- b. Electrician's Mate 1 & C
- c. NAVSEA 0901-813-0002

.11 Refer to a standard print of this system throughout this discussion.

8201.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List or describe the mode(s) of operation and/or control of this component.
- G. List the protective device(s) for this component.
- H. List the interlocks associated with this component.
- I. List the rating(s) of this component.

	A	B	C	D	E	F	G	H	I
.21 Control panel	X	X	X	X	X	X	X		
.22 M-coil motor-generator (36-kW)	X	X	X	X	X	X	X	X	
.23 A-coil motor-generator (60-kW)	X	X	X	X	X	X	X	X	
.24 Compass compensating coils	X	X	X	X	X				
.25 M-coil	X	X	X	X	X	X	X		X
.26 A-coil	X	X	X	X	X	X	X		X
.27 FI-QI coil	X	X	X	X	X	X	X		X
.28 FP-QP coil	X	X	X	X	X	X	X		X
.29 Remote control unit	X	X	X	X	X	X	X		

8201.3 COMPONENT PARTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- B. Describe the functional location of this component part with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component part.
- D. List or describe the mode(s) of operation and/or control of this component part.

### 8201.3 COMPONENT PARTS (CONT'D)

#### .31 Control panel:

A B C D

- |  |         |
|--|---------|
| a. Meters  | X X X   |
| b. Switches  | X X X   |
| c. Indicator lights                                    | X X     |
| d. Magnetic zone variation synchro                     | X X X   |
| e. H-zone transformer                                  | X X X   |
| f. Current rheostats (manual)                          | X X X X |
| g. Manual controls                                     | X X X   |
| h. Heading synchro                                     | X X X X |
| i. Coil current selector switch (manual and automatic) | X X X   |

#### .32 Remote control unit:

- |             |       |
|-------------|-------|
| a. Meters   | X X X |
| b. Controls | X X X |

### 8201.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 How the coil current, polarity and magnitude change as the ship shifts heading during automatic operation.

### 8201.5 MAJOR PARAMETERS

- Show or describe the physical location at which the parameter is displayed for monitoring.
- State the setpoints.
- State the reason(s) for the setpoints in terms of the effect of operating above or below them.

#### .51 Coil currents

A B C  
X X X

### 8201.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:

- Variations in voltage of Ship's Service 450V 60-Hz Distribution System
- Variations in gyrocompass input
- Variations of ship's course

- B. Describe the effect(s) on the following due to the operation of this system:

- Magnetic compass

8201.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ship Technical Manual, Rate Training Manuals and OPNAVINST 5100.
- B. Discuss the following safety precaution(s) unique to this system:
  - 1. Reason for proper securing procedure

8202.1 Explain the function(s) of the ELECTRIC PLANT CONTROL PANEL SYSTEM as stated in:

- a. NAVSEA 0962-070-9010
- b. Naval Ships' Technical Manual, Chapter 300 (old 9600) and Chapter 320 (old 9621)

.11 Refer to a standard print of this system throughout this discussion.

## 8202.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List or describe the mode(s) of operation and/or control of this component.
- G. List the protective device(s) for this component.
- H. Discuss the protection provided by this component.
- I. List the interlocks associated with this component.

	A	B	C	D	E	F	G	H	I
.21 Instrument meters	X	X	X	X			X		
.22 Synchroscope	X	X	X	X			X	X	X
.23 Generator controls	X	X	X	X	X	X	X		
.24 Circuit breaker switches	X	X	X	X	X		X		X
.25 Control power selector switch	X	X	X	X				X	

## 8202.3 COMPONENT PARTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- B. Describe the functional location of this component part with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component part.

	A	B	C
.31 Generator controls:			
a. Manual voltage-adjusting rheostat	X	X	X
b. Automatic voltage-adjusting rheostat	X	X	X
c. Manual automatic switch	X	X	X



### 8202.3 COMPONENT PARTS (CONT'D)

	A	B	C
d. Governor motor control switch	X	X	X
e. Generator circuit breaker switch	X	X	X
f. Field-flashing switch	X	X	X

### 8202.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

### 8202.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).  
 B. Show or describe the physical location at which the parameter is displayed for monitoring.  
 C. State the setpoints.  
 D. State the reason(s) for the setpoints in terms of the effect of operating above or below them.  
 E. State the normal operating value.

	A	B	C	D	E
.51 Generator voltage	X	X	X	X	X
.52 Load current	X	X	X	X	X
.53 Generator frequency	X	X	X	X	X
.54 Generator kilowatt load	X	X	X	X	X
.55 Field coil temperature	X	X	X	X	X

### 8202.6 SYSTEM INTERRELATIONS

- A. There are no system interrelations to be discussed.

### 8202.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ships' Technical Manual and OPNAVINST 5100.19.  
 B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8203.1 Explain the function(s) of the SHIP'S SERVICE TURBOGENERATOR SYSTEM as stated in:

- a. NAVSEA 0961-020-8010
- b. Basic Electricity
- c. Ship's Information Book
- d. Naval Ships' Technical Manual, Chapter 310 (old 9610)

.11 Refer to a standard print of this system throughout this discussion.

8203.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Describe the source(s) of power to this component.
- D. Discuss the protection provided by this component.
- E. Describe the physical location of the sensing point(s) for this component.

	A	B	C	D	E
.21 Rotor (field)	X	X	X		
.22 Stator (armature)	X	X			
.23 Slip rings	X	X			
.24 Brushes	X	X	X		
.25 Brush rigging	X	X			
.26 Space heaters	X	X	X	X	
.27 Cooling coils	X	X			
.28 Water cooler drains	X	X			
.29 Temperature monitoring sensors	X	X			X
.210 Exciter	X	X			

8203.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

8203.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The flow path of the excitation current in the generator.

8203.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. State the setpoints.
- C. State the reason(s) for the setpoints in terms of the effect of operating above or below them.

8203.5 MAJOR PARAMETERS (CONT'D)

		A	B	C
.51	Generator frequency	X	X	X
.52	Generator voltage	X	X	X
.53	Generator amperage	X	X	X
.54	Generator air temperature	X	X	X
.55	Generator kilowatt load	X	X	X

8203.6 SYSTEM INTERRELATIONS

A. Describe the effect(s) on this system due to the following:

1. Loss of steam pressure
2. Loss of cooling water
3. Loss of lube oil pressure
4. Prime mover overspeed
5. Loss of vacuum

B. There are no effects due to the operation of this system to be discussed.

8203.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ships' Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8204.1 Explain the function(s) of the SHIP'S SERVICE 450V 60-HZ DISTRIBUTION SYSTEM as stated in:

- a. Ship's Information Book
- b. NAVSEA 0962-070-9010
- c. Naval Ships' Technical Manual, Chapter 320 (old 9621)

.11 Refer to a standard print of this system throughout this discussion.

### 8204.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List or describe the mode(s) of operation and/or control of this component.
- G. List the protective device(s) for this component.
- H. Discuss the protection provided by this component.
- I. List the interlocks associated with this component.
- J. List the rating(s) of this component.
- K. List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J	K
.21 Ship's service switchboards	X	X	X	X			X				X
.22 Generator circuit breakers	X	X	X	X	X	X	X	X	X	X	X
.23 Bus tie circuit breakers	X	X	X	X	X	X	X	X	X	X	X
.24 Emergency switchboard supply circuit breakers	X	X	X	X	X	X	X	X		X	X
.25 Shore power circuit breakers	X	X	X	X	X	X	X	X	X	X	X
.26 Casualty power circuit breakers	X	X	X	X			X	X		X	X
.27 Transformers (power)	X	X		X			X				X
.28 Power panels	X	X		X			X	X			X
.29 Automatic bus transfer	X	X	X	X			X	X	X	X	X
.210 Disconnect links	X	X	X					X			X
.211 Reverse power relay	X	X	X	X	X		X	X			

### 8204.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

#### 8204.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The flow path of current from the generator circuit breaker to a designated load.

#### 8204.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. Show or describe the physical location at which the parameter is displayed for monitoring.
- C. State the setpoints.
- D. State the reason(s) for the setpoints in terms of the effect of operating above or below them.

	A	B	C	D
.51 Bus voltage	X	X	X	X
.52 Load current	X	X	X	X
.53 Frequency	X	X	X	X
.54 Kilowatt load	X	X	X	X

#### 8204.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Variations in voltage and frequency of Ship's Service Turbogenerator System
  - 2. Variations in ship's load requirements
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Shore Power System
  - 2. Ship's Service Turbogenerator System
  - 3. Casualty Power System

#### 8204.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ships' Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

## 8205 CASUALTY POWER SYSTEM

8205

- 8205.1 Explain the function(s) of the CASUALTY POWER SYSTEM as stated in:
- Ship's Information Book
  - Naval Ships' Technical Manual, Chapter 079 (old 9880)

- .11 Refer to a standard print of this system throughout this discussion.

## 8205.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- Explain the function(s) of this component in terms of what it does for the system.
- Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- Show or describe the physical location of this component.
- Describe the source(s) of power to this component.
- List the protective device(s) for this component.
- Discuss the protection provided by this component.
- List the position(s) and function(s) of each position of this component.
- List the rating(s) of this component.
- List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I
.21 Casualty power circuit breakers	X	X	X	X		X	X	X	X
.22 Switchboard terminals	X	X	X	X	X				X
.23 Bulkhead terminals	X	X	X		X				
.24 Riser terminals	X	X	X	X	X		X	X	
.25 Portable cables	X	X	X	X	X		X	X	
.26 Portable connection boxes	X	X	X		X				
.27 Terminal wrenches	X	X	X						
.28 Load terminals (energized)	X	X	X	X	X				X

## 8205.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

## 8205.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The most direct route of cable runs from a ship's service switchboard casualty power terminal to the forward emergency diesel.

## 8205.5 MAJOR PARAMETERS

8205.5 MAJOR PARAMETERS (CONT'D)

B. State the reason(s) for the setpoints in terms of the effect of operating above or below them.

- .51 Load current
- .52 Cable temperature

A	B
X	X
X	X

8205.6 SYSTEM INTERRELATIONS

- A. There are no effects on this system to be discussed.
- B. Describe the effect(s) on the following due to the operation of this system:

1. 750-kW Diesel Generating System

8205.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in Naval Ships' Technical Manual and OPNAVINST 5100.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

- 8206.1 Explain the function(s) of the SHORE POWER SYSTEM as stated in:
- Electrician's Mate 3 & 2
  - Naval Ships' Technical Manual, Chapter 300 (old 9600)
  - Ship's Information Book
- .11 Draw a simple sketch of this system from memory using appropriate symbols and showing all components listed in 8206.2.
- .12 Refer to a standard print of this system throughout this discussion.

8206.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- Explain the function(s) of this component in terms of what it does for the system.
- Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- Show or describe the physical location of this component.
- Describe the source(s) of power to this component.
- List or describe the mode(s) of operation and/or control of this component.
- List the protective device(s) for this component.
- Discuss the protection provided by this component.
- List the interlocks associated with this component.
- Describe the physical location of the sensing point(s) for this component.
- List the rating(s) of this component.
- List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J	K
.21 Connection box	X	X	X	X		X				X	
.22 Cables	X	X	X	X						X	
.23 Circuit breaker	X	X	X	X	X	X	X	X		X	X
.24 Switchboard	X	X	X	X		X					X
.25 Risers	X	X	X	X						X	X

8206.3 COMPONENT PARTS

Discuss the designated items listed below:

- Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- Describe the functional location of this component part with respect to its position in the system and the reason(s) for its location in this position.
- Show or describe the physical location of this component part.
- Describe the source(s) of power to this component part.



### 8206.3 COMPONENT PARTS (CONT'D)

- E. List the protective device(s) for this component part.
- F. Discuss the protection provided by this component part.
- G. List the position(s) and function(s) of each position of this component part.
- H. List the interlocks associated with this component part.
- I. Describe the physical location of the sensing point(s) for this component part.

#### .31 Switchboard: A B C D E F G H I

a. Meters	X	X	X	X	X			X
b. Phase sequence indicator	X	X	X	X		X		X
c. Power available lights	X	X	X	X	X			X
d. Transfer switch	X	X	X				X	X
e. Selector switch	X	X	X				X	X
f. Synchroscope switch	X	X	X				X	X

### 8206.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The flow path of current from the connection box to the switchboard.

### 8206.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. Show or describe the physical location at which the parameter is displayed for monitoring.
- C. State the setpoints.
- D. State the reason(s) for the setpoints in terms of the effect of operating above or below them.
- E. State the normal operating value.

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
.51 Voltage	X	X	X	X	X
.52 Frequency	X	X	X	X	X
.53 Load current	X	X	X	X	X

### 8206.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  1. Excessive load demand
- B. Describe the effect(s) on the following due to the operation of this system:
  1. Ship's Service 450V 60-Hz Distribution System

8206.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Ship's Information Book, Naval Ships' Technical Manual, Rate Training Manual, OPNAVINST 5100.19 and NAVMAT P-5100.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8207.1 Explain the function(s) of the 1500-KW DIESEL GENERATING SYSTEM as stated in:

- a. Naval Ships' Technical Manual, Chapter 320 (old 9621)
- b. Ship's Information Book

.11 Refer to a standard print of this system throughout this discussion

### 8207.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List or describe the mode(s) of operation and/or control of this component.
- G. List the protective device(s) for this component.
- H. Discuss the protection provided by this component.
- I. List the position(s) and function(s) of each position of this component.
- J. List the interlocks associated with this component.
- K. Describe the physical location of the sensing point(s) for this component.
- L. List the rating(s) of this component.
- M. Describe the "fail" position of this component on loss of power and the reason(s) it fails in this position.
- N. List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
.21 Emergency generator and exciter	X	X	X		X	X	X					X	X	X
.22 Emergency generator circuit breaker	X	X	X		X	X	X	X		X	X	X	X	X
.23 Casualty power breaker	X	X	X										X	X
.24 Bus tie breaker	X	X	X	X	X	X	X	X		X		X	X	X
.25 Kilowattmeter	X	X	X	X			X							
.26 Emergency generator controls	X	X	X	X		X		X	X					
.27 Voltage regulator	X	X	X	X	X	X				X		X		
.28 Voltmeter	X	X	X	X						X				
.29 Ammeter	X	X	X	X						X				
.210 Synchroscope	X	X					X			X				

### 8207.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

#### 8207.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The sequence of component involvement upon loss of ship's service power with the emergency diesel generator set up for automatic mode.
- .42 How feedback to the ship's service bus is accomplished.

#### 8207.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. State the setpoints.
- C. State the reason(s) for the setpoints in terms of the effect of operating above or below them.
- D. State the normal operating value.

	A	B	C	D
.51 Generator voltage	X	X	X	X
.52 Generator frequency	X	X	X	X
.53 Load current	X	X	X	X
.54 Generator temperature	X	X	X	X
.55 Generator kilowatt load	X	X	X	X

#### 8207.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Variations in voltage and frequency of the Ship's Service Turbogenerator System
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Ship's Service 450V 60-Hz Distribution System

#### 8207.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Ship's Information Book, Naval Ships' Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8208.1 Explain the function(s) of the 750-KW DIESEL GENERATING SYSTEM as stated in:

- a. NAVSEA 0962-070-9010
- b. NAVSEA 0961-015-2010
- c. Ship's Information Book
- d. Naval Ships' Technical Manual, Chapter 300 (old 9600)

.11 Refer to a standard print of this system throughout this discussion

## 8208.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List or describe the mode(s) of operation and/or control of this component.
- G. List the protective device(s) for this component.
- H. Discuss the protection provided by this component.
- I. List the position(s) and function(s) of each position of this component.
- J. List the interlocks associated with this component.
- K. List the rating(s) of this component.
- L. Describe the "fail" position of this component on loss of power and the reason(s) it fails in this position.
- M. List the major load(s) supplied by this component.

		A	B	C	D	E	F	G	H	I	J	K	L	M
.21	Emergency generator and exciter	X	X	X		X	X	X				X	X	
.22	Emergency generator circuit breaker (52G)	X	X	X	X	X	X	X	X	X	X	X	X	X
.23	Casualty power breaker	X	X	X	X	X	X	X	X	X	X	X		X
.24	Normal supply breaker	X	X	X	X	X	X	X	X	X	X	X	X	X
.25	Kilowattmeter	X	X	X	X									
.26	Emergency generator controls	X	X	X	X	X	X	X	X	X	X	X	X	X
.27	Voltage regulator	X	X	X	X	X	X			X				
.28	Voltmeter	X	X	X	X									
.29	Ammeter	X	X	X	X			X						
.210	Frequency meter	X	X	X	X			X						
.211	Air start solenoid	X	X	X	X		X	X					X	
.212	Governor control	X	X	X	X	X	X							
.213	Alternate circuit breaker (52B)	X	X	X	X		X						X	X

8208.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

8208.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The sequence of component involvement upon loss of ship's service power with the emergency diesel generator set up in the automatic mode.  
.42 How feedback to the ship's service bus is accomplished.

8208.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.  
B. State the setpoints.  
C. State the reason(s) for the setpoints in terms of the effect of operating above or below them.  
D. State the normal operating value.

	A	B	C	D
.51 Generator voltage	X	X	X	X
.52 Generator frequency	X	X	X	X
.53 Load current	X	X	X	X
.54 Generator temperature	X	X	X	X
.55 Generator kilowatt load	X	X	X	X

8208.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
1. Variations in voltage and frequency of the Ship's Service Turbogenerator System
  2. Loss of Ship's Service 450V 60-Hz Distribution System
- B. Describe the effect(s) on the following due to the operation of this system:
1. Ship's Service 450V 60-Hz Distribution System

8208.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ships' Technical Manual and OPNAVINST 5100.19.  
B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8209.1 Explain the function(s) of the 400-HZ MOTOR-GENERATOR SYSTEM as stated in:

- a. NAVSEA 0961-020-9010
- b. Ship's Information Book
- c. Electrician's Mate 3 & 2
- d. Naval Ships' Technical Manual, Chapter 310 (old 9610)

.11 Refer to a standard print of this system throughout this discussion.

#### 8209.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List the protective device(s) for this component.
- G. Discuss the protection provided by this component.
- H. List the interlocks associated with this component.
- I. List the rating(s) of this component.
- J. List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J
.21 Motor	X	X	X	X	X	X			X	X
.22 Generator	X	X	X	X	X		X			X
.23 Motor controller	X	X	X	X		X	X			
.24 Voltage regulator	X	X	X	X	X		X			
.25 400-Hz switchboard	X	X	X	X				X		X
.26 Frequency regulator	X	X	X	X	X					
.27 Static exciter	X	X	X	X	X					

#### 8209.3 COMPONENT PARTS

A. There are no component parts to be discussed.

#### 8209.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 How the motor and generator maintain regulated voltage and frequency.

8209.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s)
- B. Show or describe the physical location at which the parameter is displayed for monitoring.
- C. State the setpoints.
- D. State the normal operating value.

		A	B	C	D
.51	Output voltage	X	X	X	X
.52	Frequency	X	X	X	X
.53	Amperage	X	X	X	X

8209.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Variations in 450V 400-Hz distribution load
  - 2. Operation of AN/SPS-48 radar
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Combat Information Center (CIC) equipments

8209.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ships Technical Manual, Rate Training Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.



- 8210.1 Explain the function(s) of the 450V 400-HZ DISTRIBUTION SYSTEM as stated in:
- Ship's Information Book
  - NAVSEA 363-1147
  - Electrician's Mate 1 & C
  - Naval Ships' Technical Manual, Chapter 320 (old 9621)
- .11 Draw a block diagram of this system from memory using appropriate symbols and showing major components listed in 8210.2.
- .12 Refer to a standard print of this system throughout this discussion.

8210.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- Explain the function(s) of this component in terms of what it does for the system.
  - Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
  - Show or describe the physical location of this component.
  - Describe the source(s) of power to this component.
  - List or describe the source(s) of control signal(s) for this component.
  - Discuss the protection provided by this component.
  - List the interlocks associated with this component.
  - Describe the physical location of the sensing point(s) for this component.
  - List the rating(s) of this component.
  - Describe the "fail" position of this component on loss of power and the reason(s) it fails in this position.
  - List the major load(s) supplied by this component.
- |                                     | A | B | C | D | E | F | G | H | I | J | K |
|-------------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| .21 Manual bus transfer panel       | X | X | X | X |   | X | X |   | X | X |   |
| .22 400-Hz load centers             | X | X | X | X |   | X |   |   | X | X | X |
| .23 Line voltage regulators         | X | X | X | X | X | X |   |   | X | X | X |
| .24 Line voltage frequency monitors | X | X | X | X | X |   |   |   | X |   | X |
| .25 Generator circuit breaker       | X | X | X |   |   | X | X |   | X | X |   |
| .26 Bus tie circuit breakers        | X | X | X |   |   | X |   |   | X |   | X |

8210.3 COMPONENT PARTS

Discuss the designated items listed below:

- Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- Describe the functional location of this component part with respect to its position in the system and the reason(s) for its location in this position.

### 8210.3 COMPONENT PARTS (CONT'D)

C. Show or describe the physical location of this component part

.31 Line voltage regulators:

A B C

a. Voltage sensing circuit	X X X
b. Voltage reference circuit	X X X
c. Feedback circuit	X X X
d. Voltage output compensation circuit	X X X
e. Adjustment control rheostats	X X X

### 8210.4 PRINCIPLES OF OPERATION

A. There are no principles of operation to be discussed.

### 8210.5 MAJOR PARAMETERS

A. Show or describe the physical location of the sensing point(  
 B. Show or describe the physical location at which the parameter is displayed for monitoring.  
 C. State the setpoints.  
 D. State the reason(s) for the setpoints in terms of the effect of operating above or below them.

.51 Line voltage  
 .52 Line frequency

A B C D  
 X X X X  
 X X X X

### 8210.6 SYSTEM INTERRELATIONS

A. There are no effects on this system to be discussed.  
 B. Describe the effect(s) on the following due to the operation of this system:

1. 400-Hz Motor-Generator System

### 8210.7 SAFETY PRECAUTIONS

A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual, Naval Ship Technical Manual, Rate Training Manual and OPNAVINST 5100.19  
 B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8211.1 Explain the function(s) of the MAIN INTERIOR COMMUNICATIONS SWITCHBOARD SYSTEM as stated in:

- a. IC Electrician 3 & 2
- b. Ship's Information Book

.11 Refer to a standard print of this system throughout this discussion.

## 8211.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List the protective device(s) for this component.
- F. Discuss the protection provided by this component.
- G. List the position(s) and function(s) of each position of this component.
- H. Describe the physical location of the sensing point(s) for this component.
- I. Describe the "fail" position of this component on loss of power and the reason(s) it fails in this position.

	A	B	C	D	E	F	G	H	I
.21 IC switchboard buses	X	X	X	X					
.22 Bus alarms and selector switches	X	X	X	X		X			X
.23 Power availability indicator lights	X		X	X					
.24 Automatic bus transfer (ABT) switches		X	X	X	X		X		X
.25 Load switches		X	X	X		X	X	X	
.26 Action cutout (ACO) switches		X	X	X		X	X	X	
.27 Voltmeters and selector switches		X		X	X			X	
.28 Ammeters and selector switches		X		X	X			X	
.29 Frequency meter		X		X	X				X

## 8211.3 COMPONENT PARTS

A. There are no component parts to be discussed.

## 8211.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- A. How and where the signal is originated.
- B. How and where the signal is utilized.
- C. How and where the signal is detected.

#### 8211.4 PRINCIPLES OF OPERATION (CONT'D)

- D. How and where the signal is indicated.
- E. How and where the control function is accomplished.
- F. How the protective function(s) is accomplished.

	A	B	C	D	E	F
.41 Power available indications	X	X	X	X		
.42 Overload indications	X	X	X	X		
.43 ABT	X	X	X	X	X	
.44 Load switch					X	
.45 ACO switch					X	X

#### 8211.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. Show or describe the physical location at which the parameter is displayed for monitoring.
- C. Name the alarm and state the numerical value of the setpoint at which the alarm occurs.

	A	B	C
.51 Output voltage	X	X	X
.52 Current	X	X	
.53 Output frequency	X	X	X

#### 8211.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Loss of 400-Hz Motor-Generator System
  - 2. Loss of Ship's Service 450V 60-Hz Distribution System
  - 3. Loss of 120V DC power supply
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Shipboard Announcing (1MC, 3MC and 5MC) System
  - 2. MK 23 MOD C-2/C-3 Gyrocompass System

#### 8211.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8212.1 Explain the function(s) of the WIND DIRECTION AND SPEED INDICATING SYSTEM as stated in:

- a. IC Electrician 3 & 2
- b. NAVSEA 0365-262-5000
- c. Ship's Information Book

.11 Refer to a standard print of this system throughout this discussion.

8212.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.

	A	B	C	D
.21 Wind direction and speed detector (bird)	X	X	X	
.22 Wind direction transmitter	X	X	X	
.23 Wind speed transmitter	X	X	X	
.24 Wind direction and speed indicators	X	X	X	X
.25 Synchro amplifier	X	X	X	X

8212.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

8212.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- A. How and where the signal is originated.
- B. How and where the signal is utilized.
- C. How and where the signal is amplified.
- D. How and where the signal is detected.
- E. How and where the signal is indicated.
- F. How and where the signal is converted.

	A	B	C	D	E	F
.41 Wind direction indication	X	X	X	X	X	X
.42 Wind speed indication	X	X	X	X	X	X

8212.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).

8212.5 MAJOR PARAMETERS (CONT'D)

B. Show or describe the physical location at which the parameter is displayed for monitoring.

.51 Wind speed (knots)

A B

X X

.52 Wind direction (degrees)

X X

8212.6 SYSTEM INTERRELATIONS

A. Describe the effect(s) on this system due to the following:

1. Changes in ship's heading

B. Describe the effect(s) on the following due to the operation this system:

1. Flight operations

8212.7 SAFETY PRECAUTIONS

A. Discuss the safety precautions applicable to this system as specified in OPNAVINST 5100.19.

B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8213.1 Explain the function(s) of the UNDERWATER LOG SYSTEM as stated in:

- a. IC Electrician 3 & 2
- b. NAVSEA 0965-LP-073-8010

.11 Refer to a standard print of this system throughout this discussion.

8213.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Describe the source(s) of power to this component.
- D. List or describe the source(s) of control signal(s) for this component.
- E. List or describe the mode(s) of operation and/or control of this component.
- F. List the protective device(s) for this component.
- G. List the position(s) and function(s) of each position of this component.
- H. Describe the physical location of the sensing point(s) for this component.
- I. Describe the "fail" position of this component on loss of control signal and the reason(s) it fails in this position.
- J. List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J
.21 Rodmeter (pitsword)	X	X	X						X	
.22 Sea valve	X	X				X				
.23 Indicator-transmitter	X	X	X	X	X	X	X	X		X
.24 Hydraulic assembly	X	X				X	X			
.25 Synchro amplifiers (sync amps)	X	X	X	X		X			X	
.26 Speed indicator	X	X	X	X	X			X	X	X
.27 Interior communication switchboard	X	X								

8213.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

8213.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The flow path of an electrical pulse from the rodmeter to the indicator-transmitter.
- .42 The flow path of a signal from the indicator-transmitter to the synchro amplifier.

8213.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.

.51 Speed indication (knots)

A  
X

8213.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:

1. Variations in electrical load
2. Variations in ship's speed
3. Water current flow

- B. Describe the effect(s) on the following due to the operation of this system:

1. Navigational equipment
2. Fire control equipment

8213.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.



8214.1 Explain the function(s) of the UNDERWATER LOG INDICATOR-TRANSMITTER SYSTEM as stated in:

- a. NAVSEA 0365-292-5010
- b. Ship's Information Book

.11 Refer to a standard print of this system throughout this discussion.

#### 8214.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Discuss the protection provided by this component.
- D. List the position(s) and function(s) of each position of this component.

	A	B	C	D
.21 Speed dial	X	X		
.22 Action cutout switches	X	X	X	X
.23 Dummy signal unit	X	X		
.24 Power switch	X	X		X
.25 Distance counter	X	X		

#### 8214.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

#### 8214.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

#### 8214.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.

	A
.51 Ship's speed	X

#### 8214.6 SYSTEM INTERRELATIONS

- A. There are no effects on this system to be discussed.
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Dead-reckoning equipment
  - 2. Gyrocompass System
  - 3. Dummy log

8214.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

- 8215.1 Explain the function(s) of the SHIPBOARD ANNOUNCING (1MC, 3MC AND 5MC) SYSTEM as stated in:
- IC Electrician 3 & 2
  - NAVSEA 0965-009-7000
  - Ship's Information Book
- .11 Draw a block diagram of this system from memory using appropriate symbols and showing all components listed in 8215.2.
- .12 Refer to a standard print of this system throughout this discussion.

8215.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- Explain the function(s) of this component in terms of what it does for the system.
- Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- Show or describe the physical location of this component.
- Describe the source(s) of power to this component.
- List or describe the source(s) of control signal(s) for this component.
- List or describe the mode(s) of operation and/or control of this component.
- List the protective device(s) for this component.
- List the position(s) and function(s) of each position of this component.
- List the rating(s) of this component.
- List the major load(s) supplied by this component.

	A	B	C	D	E	F	G	H	I	J
.21 Preamplifier	X	X	X	X		X				X
.22 Speakers	X		X	X						
.23 Control rack	X	X	X	X	X		X			
.24 Power amplifier	X	X	X	X	X	X	X		X	X
.25 Microphone control station	X	X	X	X		X	X	X		X
.26 Oscillators	X	X	X	X	X	X				
.27 Alarm contact makers	X		X	X						

8215.3 COMPONENT PARTS

Discuss the designated items listed below:

- Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- Show or describe the physical location of this component part.

### 8215.3 COMPONENT PARTS (CONT'D)

- C. Describe the source(s) of power to this component part.
- D. List or describe the source(s) of control signal(s) for this component part.
- E. List or describe the mode(s) of operation and/or control of this component part.
- F. List the position(s) and function(s) of each position of this component part.
- G. List the rating(s) of this component part.

A B C D E F G

#### .31 Control rack:

- |                             |         |     |
|-----------------------------|---------|-----|
| a. Selector switches        | X X     | X X |
| b. Test switches            | X X     | X X |
| c. Decibel meters           | X X X X |     |
| d. Oscillator circuit board | X X X X |     |

#### .32 Microphone control station:

- |                    |       |   |
|--------------------|-------|---|
| a. Microphones     | X X X | X |
| b. Cutout switches | X X   | X |

### 8215.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- .41 The flow path of audio signal from the microphone control station to the speakers.

### 8215.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.
- B. Name the alarm and state the numerical value of the setpoint at which the alarm occurs.
- C. State the normal operating value.

A B C

- .51 Output decibels

X X X

- .52 Output voltage

X X

### 8215.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Loss of electrical load
- B. Describe the effect(s) on the following due to the operation of this system:
  - 1. Flight operations

8215.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturers' Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8216 DIAL TELEPHONE SYSTEM

8216

8216.1 Explain the function(s) of the DIAL TELEPHONE SYSTEM as stated in:

- a. NAVSEA 0365-263-0000
- b. IC Electrician 3 & 2

.11 Refer to a standard print of this system throughout this discussion.

8216.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the source(s) of control signal(s) for this component.
- F. List the protective device(s) for this component.
- G. List the position(s) and function(s) of each position of this component.
- H. Describe the "fail" position of this component on loss of power and the reason(s) it fails in this position.
- I. List the major load(s) supplied by this component.

		A	B	C	D	E	F	G	H	I
.21	Automatic switchboard	X	X	X	X	X	X	X	X	X
.22	Batteries	X	X	X	X					
.23	Ringling machines	X	X	X	X	X	X			
.24	Motor-generator set	X	X	X	X		X	X		X
.25	Power control panel	X	X	X	X			X	X	X
.26	Ringling machine control panel	X	X	X	X		X	X		X
.27	Attendant's cabinet	X	X	X	X	X	X			X
.28	Supervisory panel	X	X	X	X	X		X		X

8216.3 COMPONENT PARTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- B. Show or describe the physical location of this component part.
- C. Describe the source(s) of power to this component part.
- D. List or describe the source(s) of control signal(s) for this component part.
- E. List the protective device(s) for this component part.
- F. List the position(s) and function(s) of each position of this

## 8216.3 COMPONENT PARTS (CONT'D)

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
.31 Automatic switchboard:						
a. Finders	X	X	X	X	X	
b. Disconnect keys	X	X				X
c. Connectors	X	X	X	X	X	
d. Selectors	X	X	X	X	X	
e. Finder controls	X	X	X	X	X	
f. Line relays	X				X	X
g. Emergency cut-in relays	X	X				
h. Tone distributor	X					
.32 Power control panel:						
a. Meters	X	X	X			
b. Switches	X	X	X	X	X	
c. Fuses	X	X				
.33 Ringing machine control panel:						
a. Transfer switch	X	X				X
b. Test switch	X	X	X			X
.34 Supervisory panel:						
a. Power fail lamp	X	X	X	X		
b. Power fuse lamp	X	X	X	X		
c. Manual switchboard lamp	X	X	X	X		
d. Motor-generator fail lamp	X	X	X	X		
e. Ringing machine fail lamps	X	X	X	X		
f. Finder selector fuse lamps	X	X	X	X		
g. Connector fuse lamps	X	X	X	X		
h. Finder blocked lamps	X	X	X	X		
i. Finder release lamps	X	X	X	X		
j. Selector release lamps	X	X	X	X		
k. Connector release lamps	X	X	X	X		
l. Selector permanent lamps	X	X	X	X		
m. Connector permanent lamps	X	X	X	X		
n. Reset switches	X	X				X
o. Shore line-local line switch	X	X				X
p. Pilothouse-quarterdeck transfer switch	X	X				X
q. All-trunks-busy register counters	X	X				
r. Total calls register counters	X	X				

## 8216.4 PRINCIPLES OF OPERATION

Demonstrate an understanding of the internal operation of this system by describing/tracing:

- How and where signal is originated.
- How and where signal is utilized.
- How and where signal is detected.

#### 8216.4 PRINCIPLES OF OPERATION (CONT'D)

- D. How and where the control function is accomplished.
- E. How the alarm function(s) is accomplished.

	A	B	C	D	E
.41 Line-station-calls-idle line station	X	X	X	X	
.42 Line-station-calls-busy line station	X	X	X	X	
.43 Ship-to-shore call	X	X	X	X	
.44 Shore-to-ship call	X	X	X	X	
.45 Connector perm	X	X	X	X	X
.46 Finder blocked	X	X	X	X	X
.47 All-trunks-busy	X	X	X	X	
.48 Hunt-the-not-busy	X	X	X	X	

#### 8216.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.
- B. Name the alarm and state the numerical value of the setpoint at which the alarm occurs.
- C. State the normal operating value.

	A	B	C
.51 Current	X	X	
.52 Voltage	X	X	X

#### 8216.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  - 1. Variations in electrical load
- B. There are no effects due to the operation of this system to be discussed.

#### 8216.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.



8217.1 Explain the function(s) of the DIAL TELEPHONE ATTENDANT'S CABINET SYSTEM as stated in:

- a. IC Electrician 3 & 2
- b. Ship's Information Book

.11 Refer to a standard print of this system throughout this discussion.

## 8217.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Describe the source(s) of power to this component.
- D. List the protective device(s) for this component.
- E. Discuss the protection provided by this component.
- F. List the position(s) and function(s) of each position of this component.
- G. List the major load(s) supplied by this component.

	A	B	C	D	E	F	G
.21 Ring shore key	X	X					X
.22 Dial shore key	X	X					X
.23 Handset	X	X					
.24 Headset	X	X					
.25 Headset receptacle	X	X					
.26 Trunk-strip panel	X	X				X	X
.27 Fuse panel	X	X	X	X	X		
.28 Dial	X	X					
.29 Key panel	X	X			X		X
.210 Indicator lights	X	X	X				
.211 Line keys	X	X			X		

## 8217.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

## 8217.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

## 8217.5 MAJOR PARAMETERS

- A. There are no major parameters to be discussed.

## 8217.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  1. Operation of automatic switchboard
  2. Loss of electrical power

8217.6 SYSTEM INTERRELATIONS (CONT'D)

- B. There are no effects due to the operation of this system to be discussed.

8217.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Rate Training Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8218.1 Explain the function(s) of the 120V DC POWER SUPPLY SYSTEM as stated in:

- a. NAVSEA 0962-013-4000
- b. NAVSEA 0967-031-8010

.11 Refer to a standard print of this system throughout this discussion.

## 8218.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Describe the source(s) of power to this component.

		A	B	C
.21	Transformer	X	X	X
.22	Silicon-controlled rectifier	X	X	X
.23	Zener diode	X	X	X
.24	Voltage adjusting rheostat	X	X	
.25	Control switch	X	X	

## 8218.3 COMPONENT PARTS

- A. There are no component parts to be discussed.

## 8218.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

## 8218.5 MAJOR PARAMETERS

- A. Show or describe the physical location of the sensing point(s).
- B. Show or describe the physical location at which the parameter is displayed for monitoring.
- C. State the setpoints.
- D. State the reason(s) for the setpoints in terms of the effect of operating above or below them.

		A	B	C	D
.51	DC voltage	X	X	X	X
.52	DC amperes	X	X	X	

## 8218.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:

1. Variations in Ship's Service Turbogenerator System voltage

8218.6 SYSTEM INTERRELATIONS (CONT'D)

B. Describe the effect(s) on the following due to the operation of this system:

1. Dead-reckoning equipment

8218.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturers' Technical Manuals and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8219.1 Explain the function(s) of the MK 23 MOD C-2/C-3 GYRO SYSTEM as stated in:

- a. NAVSEA 0924-006-7010
- b. IC Electrician 3 & 2
- c. Ship's Information Book
- d. NAVSEA 0924-003-0000

.11 Refer to a standard print of this system throughout this discussion.

## 8219.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Describe the functional location of this component with respect to its position in the system and the reason(s) for its location in this position.
- C. Show or describe the physical location of this component.
- D. Describe the source(s) of power to this component.
- E. List or describe the mode(s) of operation and/or control of this component.
- F. List the protective device(s) for this component.
- G. List the position(s) and function(s) of each position of this component.
- H. List the major load(s) supplied by this component.

- .21 Binnacle
- .22 Local IC switchboard
- .23 5-kW motor-generator set
- .24 Static power supply
- .25 Power supply panel
- .26 Control panel
- .27 Alarm panel
- .28 Battery supply unit
- .29 Speed unit

A	B	C	D	E	F	G	H
X	X						
X	X	X	X		X	X	X
X	X	X	X	X	X		X
X	X	X	X	X			X
X	X	X	X	X	X	X	X
X	X	X	X	X	X	X	X
X		X	X				
X		X	X				

## 8219.3 COMPONENT PARTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- B. Show or describe the physical location of this component part.
- C. Describe the source(s) of power to this component part.
- D. List or describe the source(s) of control signal(s) for this component part.
- E. List or describe the mode(s) of operation and/or control of this component part.

### 8219.3 COMPONENT PARTS (CONT'D)

- F. List the protective device(s) for this component part.
- G. Discuss the protection provided by this component part.
- H. List the position(s) and function(s) of each position of this component part.

#### .31 Control panel:

A B C D E F G H

a. Manual azimuth switch	X	X	X				X
b. Alarm reset button	X	X					
c. Followup alarm light	X	X	X	X			
d. Corrector failure light	X	X	X	X			
e. Tilt indicator meter	X	X		X	X		
f. Latitude rheostat	X	X	X				X
g. Operation switch	X	X	X		X	X	X
h. Power switch	X	X	X		X	X	X
i. Fuses (MK 23 C-2 only)	X	X					X

### 8219.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

### 8219.5 MAJOR PARAMETERS

- A. Show or describe the physical location at which the parameter is displayed for monitoring.
- B. State the normal operating value.

	<u>A B</u>
.51 Voltage output	X X
.52 Frequency output	X X
.53 Level	X
.54 Speed (knots)	X

### 8219.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
  1. Variations in 400-Hz power
  2. Variations in electrical load
- B. Describe the effect(s) on the following due to the operation of this system:
  1. Navigation
  2. Fire control

### 8219.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturers' Technical Manuals and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.

8220.1 Explain the function(s) of the MK 19 MOD C GYROCOMPASS SYSTEM as stated in:

a. NAVSEA 0924-004-9000

.11 Refer to a standard print of this system throughout this discussion.

## 8220.2 SYSTEM COMPONENTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component in terms of what it does for the system.
- B. Show or describe the physical location of this component.
- C. Describe the source(s) of power to this component.
- D. List or describe the mode(s) of operation and/or control of this component.
- E. List the protective device(s) for this component.
- F. List the major load(s) supplied by this component.

	A	B	C	D	E	F
.21 Master compass	X	X	X	X	X	X
.22 Front panel control console	X	X	X		X	
.23 Indicator panel	X	X	X			
.24 Synchro signal amplifier	X	X	X		X	X
.25 Repeaters	X	X	X			

## 8220.3 COMPONENT PARTS

Discuss the designated items listed below:

- A. Explain the function(s) of this component part in terms of what it does for the system component and how it carries out that function.
- B. Show or describe the physical location of this component part.
- C. Describe the source(s) of power to this component part.
- D. List the position(s) and function(s) of each position of this component part.

	A	B	C	D
.31 Front panel control console:				
a. Manual azimuth switch	X	X	X	X
b. Fast settle switch	X	X	X	X
c. Drift control knob	X	X	X	
d. Master switch	X	X	X	X
e. Run button	X	X	X	
f. Fast settle lamp	X	X	X	
g. Ship's supply power light	X	X	X	
h. Standby supply power light	X	X	X	
i. Compass control alarm lights (2)	X	X	X	

8220.3 COMPONENT PARTS (CONT'D)

	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
.32 Indicator panel:				
a. Slave gyro leveling indicator	X	X	X	
b. Meridian control indicator	X	X	X	
c. Latitude indicator	X	X	X	
d. E-W speed indicator	X	X	X	
e. N-S speed indicator	X	X	X	
f. Own ship's speed indicator	X	X	X	
g. Own ship's course indicator	X	X	X	

8220.4 PRINCIPLES OF OPERATION

- A. There are no principles of operation to be discussed.

8220.5 MAJOR PARAMETERS

A. Show or describe the physical location at which the parameter is displayed for monitoring.	
	<u>A</u>
.51 Slave gyro level	X
.52 Latitude	X
.53 E-W speed	X
.54 N-S speed	X
.55 Own ship's speed	X
.56 Own ship's course	X

8220.6 SYSTEM INTERRELATIONS

- A. Describe the effect(s) on this system due to the following:
1. Loss of ship's service power
  2. High latitude operation
- B. Describe the effect(s) on the following due to the operation of this system:
1. Navigation
  2. Fire control

8220.7 SAFETY PRECAUTIONS

- A. Discuss the safety precautions applicable to this system as specified in the Manufacturer's Technical Manual and OPNAVINST 5100.19.
- B. Discuss the safety precautions applicable to each system component of this system as specified in .7A above.



8301.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the parameter indications that must be monitored.
- E. Discuss the safety precautions that must be observed.
- F. Perform the steps of this procedure.

	A	B	C	D	E	F
.11 Light off automatic degaussing unit	X	X	X	X	X	X
.12 Set up for manual operation	X	X	X	X	X	X
.13 Set up for automatic operation	X	X	X	X	X	X
.14 Set up for remote operation	X	X	X	X	X	X
.15 Secure degaussing unit	X	X	X	X	X	X

8301.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Explain how the parameters change.
- C. Describe the meter reading(s).
- D. Describe the breaker position indication(s).
- E. Describe the indicator light(s) or alarm(s).

	A	B	C	D	E
.21 While changing coil current	X	X	X	X	
.22 While changing H-zone setting	X	X	X	X	
.23 While changing magnetic variation setting	X	X	X		X
.24 When shifting to automatic operation	X	X			X
.25 When shifting to manual operation	X	X			
.26 When shifting to remote operation	X	X	X		X

8301.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications that would be received on the degaussing switchboard.
- B. List or recite the steps of the corrective action required.
- C. Indicate an understanding of this abnormal condition by describing:
  1. Probable causes.
  2. Operating limitations imposed by this abnormal condition.
  3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
- D. Perform when practicable or simulate the corrective action for this abnormal condition.

8301.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES  
(CONT'D)

		A	B	C	D
.31	Degaussing coils overheating	X	X	X	X
.32	Degaussing power supply overheating	X	X	X	X
.33	Low voltage in ship's service power supply	X	X	X	X
.34	Low current in degaussing coils	X	X	X	X
.35	High ambient temperature in degaussing switchboard room	X	X	X	X

8301.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications that would be received on the degaussing switchboard.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.
  3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

		A	B	C	D	E	F
.41	Fire in degaussing coils	X	X	X	X	X	X
.42	Fire in degaussing switchboard	X	X	X	X	X	X
.43	Fire in power supply units	X	X	X	X	X	X
.44	Loss of ship's service power	X	X	X	X	X	X
.45	Ground in degaussing coils	X	X	X	X	X	X
.46	Loss of gyrocompass signal	X	X	X	X	X	X
.47	Loss of space ventilation	X	X	X	X	X	X
.48	Loss of power supply cooling fans	X	X	X	X	X	X

8301.5 INFREQUENT and/or ABNORMAL OPERATIONS

- A. There are no infrequent or abnormal operations to be discussed.

8302.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Perform the steps of this procedure.

	A	B	C	D	E	F	G
.11 Set up ship's service turbogenerator (SSTG) electrically	X	X	X	X	X	X	X
.12 Bring SSTG on the line	X	X	X	X	X	X	X
.13 Parallel SSTG with another SSTG and/or bus tie	X	X	X	X	X	X	X
.14 Secure SSTG electrically	X	X	X	X	X	X	X
.15 Shift from ship's power to shore power	X	X	X	X	X	X	X
.16 Shift from shore power to ship's power	X	X	X	X	X	X	X
.17 Provide a feedback from emergency generator	X	X	X	X	X	X	X
.18 Shift from emergency power to ship's power	X	X	X	X	X	X	X
.19 Shift from emergency power to shore power	X	X	X	X	X	X	X
.110 Shift from shore power to emergency power	X	X	X	X	X	X	X
.111 Shift from dead plant to emergency power	X	X	X	X	X	X	X

8302.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Explain how the parameters change.
- C. Describe the meter reading(s).
- D. Describe the breaker position indication(s).
- E. Describe the bus tie position indication(s).

	A	B	C	D	E
.21 While paralleling generators	X	X	X	X	X
.22 While balancing electrical loads	X	X	X	X	X
.23 While providing power to 1S and 2S switchboards	X	X	X	X	X
.24 While monitoring meter readings	X	X	X	X	X

8302.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received by the Ship's Service Switchboard Operator.
- B. List or recite the steps of the corrective action required.
- C. Indicate an understanding of this abnormal condition by describing:

1. Probable causes.

8302.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES  
(CONT'D)

2. Operating limitations imposed by this abnormal condition.
  3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
  4. How this abnormal condition affects other watchstations.
- D. Perform when practicable or simulate the corrective action for this abnormal condition.
- |     |   | A | B | C | D |
|-----|---|---|---|---|---|
| .31 | Water out of sight in boiler                              | X | X | X | X |
| .32 | Low vacuum pressure on SSTG                               | X | X | X | X |
| .33 | Low lube oil pressure                                     | X | X | X | X |
| .34 | High generator stator temperature                         | X | X | X | X |
| .35 | High bearing temperature                                  | X | X | X | X |
| .36 | Turbine overspeed   | X | X | X | X |
| .37 | Generator overload  | X | X | X | X |
| .38 | Loud noise in turbine, reduction gears or turbo-generator | X | X | X | X |
| .39 | Continuous frequency fluctuation                          | X | X | X | X |

8302.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received by the Ship's Service Switchboard Operator.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.
  3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

		A	B	C	D	E	F
.41	Fire in switchboard	X	X	X	X	X	X
.42	Fire in turbogenerator	X	X	X	X	X	X
.43	Loss of generator due to tripping from shock or turbine overspeed	X	X	X	X	X	X

# 8302.4 EMERGENCIES and/or CASUALTIES (CONT'D)

		A	B	C	D	E	F
.44	Loss of lube oil pressure	X	X	X	X	X	X
.45	Jammed open bus tie breaker upon loss of generator	X	X	X	X	X	X
.46	Generator circuit breaker jammed while in parallel operation						
.47	High water in boiler	X	X	X	X	X	X
.48	Low water in boiler	X	X	X	X	X	X
.49	Loss of vacuum on SSTG	X	X	X	X	X	X
.410	Loss of main steam	X	X	X	X	X	X
.411	Loss of shore power	X	X	X	X	X	X
.412	Loss of control power	X	X	X	X	X	X

# 8302.5 INFREQUENT and/or ABNORMAL OPERATIONS

For the infrequent and/or abnormal operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Describe the limitations imposed by this infrequent and/or abnormal operation.
- H. Describe the conditions that require this infrequent and/or abnormal operation.
- I. Define how the parameters monitored by this watchstation are changed by this infrequent and/or abnormal operation.
- J. Perform when practicable or simulate this infrequent and/or abnormal operation.

		A	B	C	D	E	F	G	H	I	J
.51	Energize casualty power circuit breakers	X	X	X	X	X	X	X	X	X	X
.52	Control generator voltage manually	X	X	X	X	X	X	X	X	X	X
.53	Control generator speed manually	X	X	X	X	X	X	X	X	X	X

8303.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Perform the steps of this procedure.

	A	B	C	D	E	F	G
.11 Set up for manual operation	X	X	X	X	X	X	X
.12 Set up for automatic operation	X	X	X	X	X	X	X
.13 Start emergency generator manually	X	X	X	X	X	X	X
.14 Start emergency generator automatically	X	X	X	X	X	X	X
.15 Cut in circuit breaker to ship's service switchboard	X	X	X	X	X	X	X
.16 Light off and secure 400-Hz motor-generator	X	X	X	X	X	X	X

8303.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Describe the meter reading(s).
- C. Describe the breaker position indication(s).
- D. Describe the bus tie position indication(s).
- E. Describe the indicator light(s), flag(s) or alarm(s).

	A	B	C	D	E
.21 While operating emergency generator switchboard	X	X	X	X	X
.22 When supplying power to ship's service switchboard	X	X	X	X	X
.23 When supplying casualty power	X	X	X		
.24 When starting emergency generator manually		X		X	
.25 While setting up switchboard for automatic operation	X	X	X	X	X
.26 While maintaining 400-Hz motor-generator sets within proper parameters	X	X	X	X	X

8303.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received on the emergency switchboard.
- B. List or recite the steps of the corrective action required.
- C. Indicate an understanding of this abnormal condition by describing:

1. Probable causes.

8303.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES (CONT'D)

2. Operating limitations imposed by this abnormal condition.
3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
4. How this abnormal condition affects other watchstations.

D. Perform when practicable or simulate the corrective action for this abnormal condition.

	A	B	C	D
.31 Failure of emergency generator to start in automatic mode	X	X	X	X
.32 Overspeed of emergency generator	X	X	X	X
.33 Low lube oil pressure to diesel	X	X	X	X
.34 Low cooling water pressure to diesel	X	X	X	X
.35 Low ship's service high-pressure air	X	X	X	X
.36 Low fuel oil in day tank	X	X	X	X
.37 High bearing temperature on 400-Hz motor-generator set	X	X	X	X

8303.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received by the emergency switchboard.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.
  3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

	A	B	C	D	E	F
.41 Fire in emergency generator	X	X	X	X	X	X
.42 Fire in emergency switchboard	X	X	X	X	X	X
.43 Loss of emergency generator due to trip from shock of overspeed	X	X	X	X	X	X





8304.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Perform the steps of this procedure.

		A	B	C	D	E	F	G
.11	Complete system checkout for getting underway	X	X	X	X			X
.12	Coordinate rigging/unrigging and connecting/disconnecting of shore power cables	X	X	X	X	X	X	X
.13	Supervise shift of ship's power to shore power or vice versa	X	X	X	X	X	X	X
.14	Supervise shift from shore power to emergency ship's power or vice versa	X	X	X	X	X	X	X
.15	Coordinate EM training program	X	X	X	X	X	X	X
.16	Coordinate procurement and control of EM material	X	X	X	X	X	X	X
.17	Check quality of repair/PMS job accomplished by EM group	X	X	X	X	X	X	X

8304.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Explain how the parameters change.
- C. Describe the meter reading(s).
- D. Describe the gauge reading(s).
- E. Describe the breaker position indication(s).
- F. Describe the bus tie position indication(s).
- G. Describe the indicator alarm(s).

		A	B	C	D	E	F	G
.21	SSTG/switchboard setup during in-port steaming (auxiliary)	X	X	X	X	X	X	X
.22	SSTG/switchboard setup while underway	X	X	X	X	X	X	X
.23	SSTG/switchboard setup during General Quarters (GQ)	X	X	X	X	X	X	X
.24	When shifting ship's power to shore power or vice versa	X	X	X	X	X	X	X
.25	When shifting from shore power to emergency power or vice versa	X	X	X	X	X	X	X
.26	When energizing equipments prior to getting underway	X	X	X			X	X
.27	When securing equipments after ship is moored or anchored	X	X	X			X	X
.28	While performing operational tests on selected equipments	X	X	X		X	X	X

### 8304.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received by the Electrical Supervisor.
  - B. List or recite the steps of the corrective action required.
  - C. Indicate an understanding of this abnormal condition by describing:
    - 1. Probable causes.
    - 2. Operating limitations imposed by this abnormal condition.
    - 3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
    - 4. How this abnormal condition affects other watchstations.
  - D. Perform when practicable or simulate the corrective action for this abnormal condition.
- |   |  | A | B | C | D |
|---|--|---|---|---|---|
| .31 Volt/frequency variations with load changes           |  | X | X | X | X |
| .32 Loss of ship's service electrical power               |  | X | X | X | X |
| .33 Overheating shore power connections                   |  | X | X | X | X |
| .34 Loss of shore power                                   |  | X | X | X | X |
| .35 Zero ground on 450V 60-Hz distribution system         |  | X | X | X | X |
| .36 Erratic operation of SSTG/emergency generating system |  | X | X | X | X |

### 8304.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received by the Electrical Supervisor.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  - 1. Corrective action provided.
  - 2. Protection provided.
  - 3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  - 1. Probable causes.
  - 2. Operating limitations imposed by this emergency and/or casualty.
  - 3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  - 4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

#### 8304.4 EMERGENCIES and/or CASUALTIES (CONT'D)

		A	B	C	D	E	F
.41	Fire in shore power connection box	X	X	X	X	X	X
.42	Fire in electric plant control panel (EPCP)	X	X	X	X	X	X
.43	Fire in battery charger	X	X	X	X	X	X
.44	Fire in small craft electrical system	X	X	X	X	X	X
.45	Fire in galley equipment	X	X	X	X	X	X
.46	Fire in laundry equipment	X	X	X	X	X	X

#### 8304.5 INFREQUENT and/or ABNORMAL OPERATIONS

For the infrequent and/or abnormal operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Describe the limitations imposed by this infrequent and/or abnormal operation.
- H. Describe the conditions that require this infrequent and/or abnormal operation.
- I. Perform when practicable or simulate this infrequent and/or abnormal operation.

		A	B	C	D	E	F	G	H	I
.51	Rig/unrig casualty power	X	X	X	X	X	X	X	X	X

8305.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the communications that must be established and/or utilized.
- D. Discuss the parameter indications that must be monitored.
- E. Discuss the safety precautions that must be observed.
- F. Perform the steps of this procedure.

	A	B	C	D	E	F
.11 Energize IMC, 3MC and 5MC central amplifier systems	X	X		X		X
.12 Select, set up and test IMC, 3MC and 5MC central amplifier systems		X	X		X	X
.13 Secure IMC, 3MC and 5MC central amplifier systems	X	X			X	X
.14 Energize underwater log system	X	X		X	X	X
.15 Secure underwater log system	X	X		X	X	X
.16 Energize wind direction and speed indicating system	X	X		X	X	X
.17 Secure wind direction and speed indicating system	X	X		X	X	X
.18 Energize gyrocompass synchro amplifier	X	X		X	X	X
.19 Secure gyrocompass synchro amplifier	X	X			X	X
.110 Light off gyrocompass system	X	X	X	X	X	X
.111 Secure gyrocompass system	X	X	X	X	X	X
.112 Energize 400-Hz motor-generator set	X	X		X	X	X
.113 Secure 400-Hz motor-generator set	X	X		X	X	X
.114 Energize DC power rectifiers	X	X		X	X	X
.115 Secure DC power rectifiers	X	X		X	X	X
.116 Energize dial telephone motor-generator set	X	X		X	X	X
.117 Secure dial telephone motor-generator set	X	X		X	X	X
.118 Shift power sources on IC switchboard	X	X		X	X	X
.119 Energize IC and FC circuits on switchboard	X	X			X	X
.120 Secure IC and FC circuits on switchboard	X	X			X	X

8305.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Explain how the parameters change.
- C. Describe the meter reading(s).
- D. Describe the disconnect position indication(s).
- E. Describe the bus tie position indication(s).
- F. Describe the indicator light(s), flag(s) or alarm(s).

	A	B	C	D	E	F
.21 During underway conditions	X	X	X	X	X	X
.22 Under battle conditions	X	X	X	X	X	X
.23 During changes in operation of IC systems	X	X	X	X	X	X
.24 While shifting from normal to emergency power	X	X	X	X	X	X
.25 When systems are on emergency power	X	X	X	X	X	X
.26 When systems are on casualty power	X	X	X	X	X	X
.27 When energizing equipment for ship's operation	X	X	X	X	X	X

## 8305.2 NORMAL OPERATIONS (CONT'D)

		A	B	C	D	E	F
.28	While securing equipment after ship's operation	X	X	X	X	X	X
.29	During in-port steaming conditions (auxiliary)	X	X	X	X	X	X

## 8305.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received by the IC Room Operator.
- B. List or recite the steps of the corrective action required.
- C. Indicate an understanding of this abnormal condition by describing:
  1. Probable causes.
  2. Operating limitations imposed by this abnormal condition.
  3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
  4. How this abnormal condition affects other watchstations.
- D. Perform when practicable or simulate the corrective action for this abnormal condition.

		A	B	C	D
.31	Fluctuations of power to IC switchboard	X	X	X	X
.32	High or low indications in voltage and/or frequency	X	X	X	X
.33	Erratic operation of gyrocompass system	X	X	X	X
.34	Erratic operation of underwater log system	X	X	X	X
.35	Synchro signal amplifier error	X	X	X	X
.36	Overload indication	X	X	X	X
.37	Blown fuse indications	X	X	X	X
.38	Grounded circuit or components	X	X	X	X

## 8305.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received by the IC Room Operator.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.



8306.1 OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the communications that must be established and/or utilized.
- D. Discuss the parameter indications that must be monitored.
- E. Discuss the safety precautions that must be observed.
- F. Perform the steps of this procedure.

	A	B	C	D	E	F
.11 Acknowledge local call	X	X	X	X	X	X
.12 Select idle shore trunk	X	X	X	X	X	X
.13 Complete local-to-shore call through an automatic exchange	X	X	X	X	X	X
.14 Complete local-to-shore call through a common battery exchange	X	X	X	X	X	X
.15 Complete local-to-shore call through a magneto ring exchange	X	X	X	X	X	X
.16 Release trunks (automatic and magento exchanges)	X	X	X	X	X	X
.17 Acknowledge shore trunk call	X	X	X	X	X	X
.18 Select idle local trunk	X	X	X	X	X	X
.19 Complete shore-to-local call	X	X	X	X	X	X
.110 Emergency disconnect local trunk	X	X	X	X	X	X
.111 Emergency disconnect shore trunk	X	X	X	X	X	X

8306.2 NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Define the parameter(s) monitored.
- B. Explain how the parameters change.
- C. Describe the disconnect position indication(s).
- D. Describe the indicator light(s)/flag(s)/alarm(s).

	A	B	C	D
.21 During local trunk call	X	X	X	X
.22 During shore trunk call	X	X	X	X

8306.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received on the Attendant's Cabinet.
- B. List or recite the steps of the corrective action required.
- C. Indicate an understanding of this abnormal condition by describing:
  1. Probable causes.

8306.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES  
(CONT'D)

2. Operating limitations imposed by this abnormal condition.
3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
4. How this abnormal condition affects other watchstations.

D. Perform when practicable or simulate the corrective action for this abnormal condition.

	A	B	C	D
.31 Trunk fails to release	X	X	X	X
.32 Shore exchange fails to acknowledge call	X	X	X	X

8306.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received on the Attendant's Cabinet.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
  1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
  1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.
  3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

	A	B	C	D	E	F
.41 Handset or headset failure	X	X	X	X	X	X
.42 Fire in attendant's cabinet	X	X	X	X	X	X
.43 Lamp signal fails to indicate normally	X	X	X	X	X	X
.44 Dial on attendant's cabinet fails	X	X	X	X	X	X
.45 Switch key fails to connect or disconnect	X	X	X	X	X	X
.46 Buzzer fails to operate	X	X	X	X	X	X

8306.5 INFREQUENT and/or ABNORMAL OPERATIONS

- A. There are no infrequent or abnormal operations to be discussed.



8307.1      OPERATIONS

For the operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Perform the steps of this procedure.

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>
.11	Prepare worklist for IC equipment corrective maintenance	X	X	X				X
.12	Prepare procedure for watchstanding	X	X	X	X	X		X
.13	Coordinate procurement and control of IC materials and supplies	X	X	X	X			X
.14	Check quality of repair work accomplished by IC group	X	X	X	X	X	X	X
.15	Ensure operational readiness of all IC equipments for getting underway	X	X	X	X	X	X	X

8307.2      NORMAL OPERATIONS

For the conditions or evolutions listed below:

- A. Explain how the parameters change.
- B. Describe the meter reading(s).
- C. Describe the disconnect position indication(s).
- D. Describe the bus tie position indication(s).
- E. Describe the indicator alarm(s).

		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
.21	During in-port steaming (auxiliary)	X	X	X	X	X
.22	While underway	X	X	X	X	X
.23	During General Quarters	X	X	X	X	X
.24	When energizing equipments prior to getting underway	X	X	X	X	X
.25	When securing equipments after ship is moored/anchored	X	X	X	X	X
.26	When shifting from ship's electrical power	X	X	X	X	X
.27	While performing operational tests on selected equipments	X	X	X	X	X

8307.3      ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES

For the abnormal conditions listed below:

- A. Describe all indications and alarms that would be received in the IC Room.
- B. List or recite the steps of the corrective action required.

07.3 ABNORMAL CONDITIONS that could lead to EMERGENCIES and/or CASUALTIES  
(CONT'D)

- C. Indicate an understanding of this abnormal condition by describing:
1. Probable causes.
  2. Operating limitations imposed by this abnormal condition.
  3. Other emergencies and/or casualties that may arise if this abnormal condition is not corrected.
  4. How this abnormal condition affects other watchstations.
- D. Perform when practicable or simulate the corrective action for this abnormal condition.

	A	B	C	D
.31 Loss of 450V 400-Hz power supply	X	X	X	X
.32 Loss of 115V 60-Hz power supply	X	X	X	X
.33 Erratic operation of underwater log	X	X	X	X
.34 Erratic operation of gyrocompass	X	X	X	X

07.4 EMERGENCIES and/or CASUALTIES

For the emergencies and/or casualties listed below:

- A. Describe all indications and alarms that would be received by the IC Room.
- B. List or recite the steps of procedure for the immediate action portion of this emergency and/or casualty.
- C. Explain the reason for each step of this emergency and/or casualty procedure in terms of:
1. Corrective action provided.
  2. Protection provided.
  3. Investigative action performed.
- D. Indicate an understanding of this emergency and/or casualty by describing:
1. Probable causes.
  2. Operating limitations imposed by this emergency and/or casualty.
  3. Other emergencies and/or casualties that may arise if this emergency and/or casualty is not corrected.
  4. How this emergency and/or casualty affects other watchstations.
- E. Outline the followup action required.
- F. Perform when practicable or simulate the corrective action for this emergency and/or casualty.

	A	B	C	D	E	F
.41 Loss of ship's power underway	X	X	X	X	X	X
.42 Fire in IC equipment	X	X	X	X	X	X
.43 Loss of visual/audio signal or alarm system	X	X	X	X	X	X
.44 Loss of gyrocompass	X	X	X	X	X	X

## 8307.4 EMERGENCIES and/or CASUALTIES (CONT'D)

	A	B	C	D	E	F
.45 Failure of MC systems	X	X	X	X	X	X
.46 Loss of wind direction and speed indicating system	X	X	X	X	X	X

## 8307.5 INFREQUENT and/or ABNORMAL OPERATIONS

For the infrequent and/or abnormal operations listed below:

- A. Describe the steps of this procedure.
- B. Explain the reasons for each step of this procedure.
- C. Discuss the control/coordination required when using this procedure.
- D. Discuss the communications that must be established and/or utilized.
- E. Discuss the parameter indications that must be monitored.
- F. Discuss the safety precautions that must be observed.
- G. Describe the limitations imposed by this infrequent and/or abnormal operation.
- H. Describe the conditions that require this infrequent and/or abnormal operation.
- I. Define how the parameters monitored by this watchstation are changed by this infrequent and/or abnormal operation.
- J. Perform when practicable or simulate this infrequent and/or abnormal operation.

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